

In the Claims

1. (cancelled) A method of thermoacoustic imaging of structures of tissue, comprising immersing said tissue in an acoustic coupling media for acoustically coupling said tissue to an acoustic sensor array,  
  
delivering to said tissue a fluorescent dye responsive to electromagnetic radiation,  
  
irradiating said tissue with a source of electromagnetic radiation at a first frequency to stimulate fluorescence of said dye and a thermoacoustic response thereto, detecting said thermoacoustic response and producing therefrom a dye-enhanced image of structures of said tissue.
2. (cancelled) The method of claim 1 further comprising irradiating said tissue with a source of electromagnetic radiation at a second frequency stimulating substantially less fluorescence than said first frequency, and detecting a thermoacoustic response to said second frequency stimulation and producing therefrom an unenhanced image of structures of said tissue.
3. (cancelled) The method of claim 2 further comprising combining said dye-enhanced and unenhanced images of structures of said tissue.
4. (cancelled) The method of claim 3 wherein combining said images comprises forming a difference between said images.

5. (cancelled) The method of claim 1 further comprising stimulating said tissue with acoustic excitation and detecting an acoustic echo thereof, and producing therefrom an ultrasonic image of structures of said tissue.
6. (cancelled) The method of claim 5 further comprising combining said dye-enhanced and ultrasonic images of structures of said tissue.
7. (cancelled) The method of claim 6 wherein combining said images comprises forming a difference between said images.
8. (cancelled) A thermoacoustic imaging system for imaging structures of tissue, comprising  
a source of light for illuminating said tissue to stimulate a thermoacoustic response, with a frequency of light that is subject to scattering and attenuation within 10 mm of penetration into said tissue,  
an acoustic coupling media for acoustically coupling said tissue to an acoustic sensor array, and  
an acoustic sensor array for detecting said thermoacoustic response and producing therefrom an image of tissue structure with 10 mm of the surface of said tissue.
9. (cancelled) A thermoacoustic imaging system for imaging structures of tissue, comprising

a source of electromagnetic radiation for irradiating said tissue to stimulate a thermoacoustic response,  
an acoustic coupling media for acoustically coupling said tissue to an acoustic sensor array,  
an acoustic sensor array for detecting said thermoacoustic response, comprising a linearly arranged array of transducers, and  
circuitry for reconstructing an image of said tissue from thermoacoustic response detected by said linearly arranged array of transducers.

10. (new) An imaging system for imaging structures of tissue, comprising:  
a transducer array;  
an acoustic receiver coupled to said detector array for receiving acoustic signals generated in response to radiant energy delivered to said tissue and detected by said detector array;  
an ultrasound receiver coupled to said detector array for receiving echoes from an ultrasonic beam delivered into said tissue; and  
an ultrasound beam steering circuit coupled to said detector array for causing said array to generate said ultrasonic beam.

11. (new) The imaging system of claim 10 further comprising a TACT processing system for producing TACT images using acoustic signals detected by the said detector array, said TACT receiver coupled to said TACT processing system.

12. (new) The imaging system of claim 10 further comprising an ultrasound imaging system, said ultrasound receiver coupled to said ultrasound imaging system.

13. (new) The imaging system of claim 10 wherein said ultrasound beam steering circuit is coupled to and controlled by an ultrasound imaging system.

14. (new) The imaging system of claim 11, wherein said TACT processing system sends images to a display.

15. (new) The imaging system of claim 12, where in said ultrasound imaging system sends images to a display.

16. (new) A method for using an imaging system for imaging structures of tissue, comprising:
- coupling a transducer array to said tissue;
  - receiving acoustic signals originated within said tissue in response to radiant energy delivered to said tissue;
  - delivering an ultrasound beam into said tissue;
  - receiving echoes of said ultrasound beam with an ultrasound receiver; and
  - generating an image of said tissue from one or both of said thermoacoustically generated signals and said echoes of said ultrasound beam.
17. (new) The method of claim 16, wherein an image of the tissue is created from said echoes and an image of the tissue is created from said thermoacoustically generated signals, and said images are presented on display overlaid in spacial registration or in comparison with each other.
18. (new) The method of claim 16, wherein said thermoacoustically generated signals are delivered to a TACT processing system for producing TACT images using acoustic signals detected by the said detector array.
19. (new) The method of claim 16, wherein said ultrasound echoes are sent to an ultrasound imaging system.

20. (new)      The method of claim 16, wherein said ultrasound beam is generated using steering delays controlled by an ultrasound imaging system.

21. (new)      The method of claim 18, wherein said TACT processing system sends images to a display.

22. (new)      The method of claim 19, where in said ultrasound imaging system sends images to a display.